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IS 9470 (1979): Method of test for the usability of resistors under pulse conditions [LITD 5: Semiconductor and Other Electronic Components and Devices]



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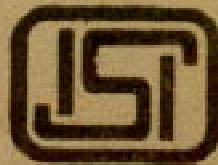
IS : 9470 - 1979

(Reaffirmed 2002)

Indian Standard

METHOD OF TEST FOR THE USABILITY OF RESISTORS UNDER PULSE CONDITIONS

UDC 621.316.8 : 620.16



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INDIAN STANDARDS INSTITUTION
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

Price Rs. 5.00

Gr 2

July 1980

Indian Standard

METHOD OF TEST FOR THE USABILITY OF RESISTORS UNDER PULSE CONDITIONS

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(Continued from page 1)

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Indian Standard

METHOD OF TEST FOR THE USABILITY OF RESISTORS UNDER PULSE CONDITIONS

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 28 November 1979, after the draft finalized by the Resistors Sectional Committee had been approved by the Electronics and Telecommunication Division Council.

0.2 The object of this Indian Standard is to specify test method to determine the usability of resistors under conditions of very short high overloads occurring periodically.

0.3 This standard is largely based on the following documents issued by International Electrotechnical Commission:

40 (Secretariat) 342 Draft — Amendment to IEC Publication 115-1 : Fixed resistors — Part I : Terms and methods of test — Method of test for the usability of resistors under pulse conditions.

40 (Secretariat) 343 Draft — Tentative list of preferred test severities to be used for testing resistors under pulse conditions.

0.4 In reporting the result of a test or analysis made in accordance with this standard, if the final value, observed or calculated, is to be rounded off, it shall be done in accordance with IS : 2-1960*.

1. SCOPE

1.1 This standard specifies test methods which, under stated pulse conditions, show changes in component parameters arising from pulse loading basically due to:

- a) local thermal stresses,
- b) internal voltage effects, and
- c) electrical current load effects including mechanical forces.

*Rules for rounding off numerical values (*revised*).

1.2 Where this test is called for in the detail specification it shall be applied in order to show the feasibility of using the component under stated conditions of pulse loading.

2. TERMINOLOGY

2.0 For the purpose of this standard, the following terms and definitions shall apply.

2.1 Pulse Duration — The duration between pulse start time and pulse stop time.

2.2 Pulse Repetition Period — The interval between the pulse start time of a first pulse waveform and the pulse start time of the immediately following pulse waveform in a periodic pulse train.

2.3 Pulse Load Capability — The ability of a component to withstand a continuous sequence of equally spaced, equal electrical pulses during a specified time without more than a definite change in electrical parameters.

2.4 Pulse Ratings — Assessed values of pulse load capability expressed limiting pulse parameters with respect to power, voltage, or current.

3. TEST PROCEDURE

3.1 Description of the Test Set-Up — The pulse source shall be able to produce a continuous sequence of the specified pulse with the specified repetition period over the specified duration of the test. Care has to be taken not to influence one test specimen by others. This may demand a separate output stage for each specimen.

A block diagram of a suitable test set-up is given in Fig. 1. It consists of a series of power amplifiers with low internal impedance (R_i) as compared to the sample (R) under test (voltage source), which can transmit the specified pulse train within the distortion limits given in Fig. 2. These amplifiers are fed from a conventional pulse generator delivering the desired waveform, when necessary via further forming, shifting, and driving stages.

To permit the use of a more economical power supply for the driver and power stages in testing many resistors at the same time, it is recommended to drive them sequentially by appropriately phased pulses.

Unless otherwise specified in the relevant specification the pulse train shall be applied from a constant voltage source with permitted distortion of the pulse as given in Fig. 2.

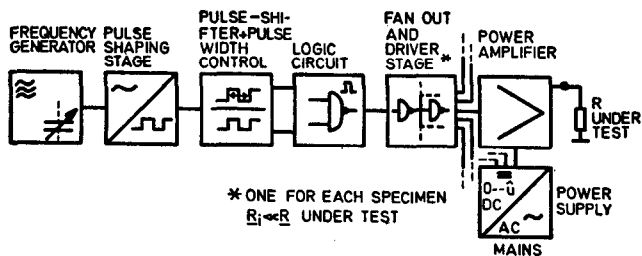


FIG. 1 BLOCK DIAGRAM OF A SET-UP FOR PULSE TESTING OF RESISTORS

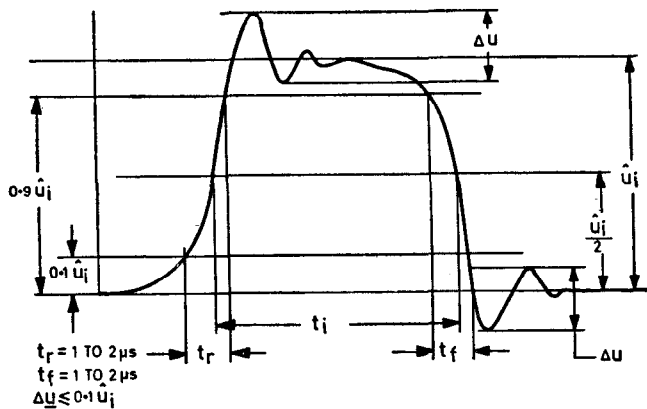


FIG. 2 TOLERANCES ON THE PULSE SHAPE

3.2 Severities — A test severity shall be chosen from those specified in Table 1 and shall be specified in the relevant specification. If no severity is specified, severity 3 shall be used.

TABLE 1 TENTATIVE LIST OF SEVERITIES

SL No.	PARAMETER	SEVERITIES			
		1	2	3	4
(1)	(2)	(3)	(4)	(5)	(6)
i)	Peak voltage U (multiples of U_R)	2.5	4.5	5	8.5
ii)	Pulse width t_i , (μs)	10	1 000	100	2 000
iii)	Pulse repetition period t_p , (μs)	625	20 000	2 500	143 000
iv)	Equivalent average power P (% of P_R)	100	100	100	100
v)	Duration of test, (hours)	100	100	100	1 000

NOTE — These severities are intended to be used with figures of permitted change of resistance similar to those used with the endurance tests.

The severity of the test is given by peak voltage, pulse duration, pulse repetition period and by its total duration and the ambient temperature.

3.3 Preconditioning — Before the test begins, the resistors shall have attained temperature and humidity equilibrium under standard atmospheric conditions for testing [*see* IS : 9000 (Part I)-1977*].

For special applications other preconditioning requirements may be given in the relevant specification.

3.4 Initial Measurements — Unless otherwise specified the resistors shall be visually examined and the resistance shall be measured with an error not exceeding 10 percent of the maximum permitted change.

3.5 Conditioning

3.5.1 The method of mounting of the resistor shall be specified in the relevant specification and shall be thermally equivalent to normal endurance testing. The mounting shall not distort the pulse shape to outside the limits given in Fig. 2.

3.5.2 The resistor shall be subjected at room temperature (or at such other temperature as given in the relevant specification) to a continuous train of rectangular pulses delivering the severity specified by the relevant specification.

3.6 Intermediate Measurements — May be performed to shorten the test in the case of exceptional poor behaviour of the resistors under test after 24, 100 and 500 hours.

3.7 Recovery — Two to four hours at standard atmospheric conditions for testing [*see* IS : 9000 (Part I) - 1977*].

3.8 Final Measurements — The resistors shall be visually examined. There shall be no indication of mechanical or insulation breakdown. The marking shall remain legible.

Then the resistance shall be measured. The change against the value from the initial measurement (*see* 3.4) shall not be more than that permitted in the relevant specification.

3.9 Information to be Given in the Relevant Specification — The relevant specification shall give the following details:

- a) Method of mounting of the resistor for the test;
- b) Test severity, chosen from Table 1. Severity 3 shall be preferred;
- c) Test ambient temperature, if other than $27 \pm 2^{\circ}\text{C}$;
- d) Limiting value of voltage; and
- e) Permissible resistance change.

*Basic environmental testing procedures for electronic and electrical items: Part I General.